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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :

Kazutomo HIGA : **Attn: BOX PCT**

Serial No. NEW : Docket No. 2001_1202A

Filed September 12, 2001 :

MANUFACTURING APPARATUS OF PRINTED WIRING BOARD, AND MANUFACTURING METHOD OF PRINTED WIRING BOARD USING THE SAME

**[Corresponding to PCT/JP01/00085
Filed January 11, 2001]**

FIRST PRELIMINARY AMENDMENT

Assistant Commissioner for Patents,
Washington, DC 20231

Sir:

Please amend the above-identified application as follows.

In the Claims:

Kindly cancel claims 38-41 without prejudice.

Kindly amend claims 45, 67 and 68 as follows.

45. (Amended) The manufacturing apparatus of printed wiring board of claim 43, wherein the mechanism for oscillating the nozzle pipe is an independent mechanism in each nozzle pipe.

67. (Amended) The manufacturing apparatus of printed wiring board of claim 1, wherein the treating solution is an etchant.

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68. (Amended) The manufacturing method of printed wiring board of claim 8, wherein the treating solution is an etchant.

REMARKS

The above claim amendments are presented in order to remove multiple claim dependencies, so as to reduce the required filing fee.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

Respectfully submitted,

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a first treating booth having plural nozzle pipes mounting a plurality of spray nozzles and disposed at a certain angle to the running direction of the printed wiring board; and

a second treating booth having plural nozzle pipes disposed at a reverse angle to the above nozzle pipes;

a mechanism for oscillating the nozzle pipes in the first treating booth and the second treating booth;

plural pumps corresponding to each nozzle pipe for supplying a treating solution to the nozzle pipes; and

a pressure gauge connected in an individual passage between each nozzle pipe and the pump;

wherein the output of each pump is controlled by an inverter circuit or a current or voltage control circuit.

45. The manufacturing apparatus of printed wiring board of claim 43 ~~or 44~~, wherein the mechanism for oscillating the nozzle pipe is an independent mechanism in each nozzle pipe.

46. The manufacturing apparatus of printed wiring board of claim 45, wherein the oscillating angle and oscillating speed are individually variable in the independent mechanism for oscillating the each nozzle pipe.

47. The manufacturing apparatus of printed wiring board of claim 46, wherein a cam, a link mechanism, and a control motor are provided in the each nozzle pipe as the independent mechanism for oscillating each nozzle pipe.

48. The manufacturing apparatus of printed wiring board of claim 47, wherein the oscillating angle of each nozzle pipe is variable by adjusting the cam and link mechanism.

49. The manufacturing apparatus of printed wiring board of claim 47, wherein the rotating speed of the control motor is controlled by an inverter circuit or a current or voltage control circuit, and the oscillating speed of the each nozzle pipe is varied.

50. The manufacturing apparatus of printed wiring board of claim 46, wherein a stepping motor is used as the independent mechanism for oscillating the each nozzle pipe.

51. The manufacturing apparatus of printed wiring board of claim 50, wherein the rotating angle or rotating speed of the stepping motor are controlled by a control and drive circuit.

manufacturing apparatus of printed wiring board of claim 52, being characterized by calculating the treating area data of each division block from the CAD data for drawing a wiring pattern of printed wiring board, feeding the treating area data into storing means, oscillating he nozzle pipes at specified oscillating angle and oscillating speed at the pressure setting of each nozzle pipe corresponding to each pump output, and conveying the printed wiring board at a specified speed while blowing a treating solution to the printed wiring board.

65. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 53, being characterized by calculating the treating area data of each division block from the CAD data for drawing a wiring pattern of printed wiring board, feeding the treating area data into storing means, oscillating the nozzle pipes at pressure setting and oscillating speed of each nozzle pipe corresponding to each pump output, and conveying the printed wiring board at a specified speed while blowing a treating solution to the printed wiring board.

66. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 54, being characterized by calculating the treating area data of each division block from the CAD data for drawing a wiring pattern of printed wiring board, feeding the treating area data into storing means, oscillating the nozzle pipes at pressure setting of each nozzle pipe corresponding to each pump output and the rotating angle or rotating speed of the stepping motor, and conveying the printed wiring board at a specified speed while blowing a treating solution to the printed wiring board.

67. The manufacturing apparatus of printed wiring board of any one of claims 1, ~~3, 5, 10, 20, 43, and 44,~~ wherein the treating solution is an etchant.

68. The manufacturing method of printed wiring board of any one of claims 8, ~~9, 17 to 19, 36, 37, 42, 59, 61, and 64 to 66,~~ wherein the treating solution is an etchant.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	
Kazutomo HIGA	:	**Attn: BOX PCT**
Serial No. NEW	:	Docket No. 2001_1202A
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MANUFACTURING APPARATUS OF PRINTED WIRING BOARD, AND MANUFACTURING METHOD OF PRINTED WIRING BOARD USING THE SAME

**[Corresponding to PCT/JP01/00085
Filed January 11, 2001]**

SECOND PRELIMINARY AMENDMENT

Assistant Commissioner for Patents,
Washington, DC 20231

Sir:

Please amend the above-identified application as follows.

In the Claims:

Kindly cancel claims 1-37 and 42-68 without prejudice.

Kindly add new claims 69-166 as follows.

69. (New) A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

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a plurality nozzle pipes disposed nearly at a uniform interval, the nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes; and

a pump for supplying a treating solution to the nozzle pipes,

wherein at least one of the plural nozzle pipes has a different diameter than other of the nozzle pipes.

70. (New) The manufacturing apparatus of claim 69, wherein a first nozzle pipe located at a center among the nozzle pipes has a larger diameter than other of the first nozzle pipe of the nozzle pipes.

71. (New) A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes disposed nearly at a uniform interval, the nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes; and

a plurality of piping pipes disposed between the nozzle pipes and the pump, respectively;

wherein at least one of the piping pipes has a different diameter than other of the one of the piping pipes.

72. (New) The manufacturing apparatus of claim 71,

wherein each of the nozzle pipes has the same diameter, and

wherein a first piping pipe disposed at a nozzle pipe located at a center among the nozzle pipes has a larger diameter than other of the first piping pipe of the piping pipes.

73. (New) A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

pressure regulating valves disposed in passages between the pump and the nozzle pipes, respectively; and

pressure gauges disposed in the passages, respectively.

74. The manufacturing apparatus of claim 73, wherein nozzle pipes located at a center among the nozzle pipes are disposed at a narrower interval than other of the nozzle pipes.

75. (New A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

flow rate regulating valves disposed in passages between the pump and the nozzle pipes, respectively; and

flow meters disposed in the passages, respectively.

76. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

pressure regulating valves disposed in passages between the pump and the nozzle pipes, respectively; and

pressure gauges disposed in the passages, respectively,

said method comprising the steps of:

adjusting the pressure regulating valves for having a first pressure gauge disposed for a nozzle pipe located at a center among the nozzle pipes indicate a higher pressure than other of the first pressure gauge of the pressure gauges, the first pressure gauge being included in the pressure gauges; and

conveying the printed wiring board while oscillating the nozzle pipes at a constant angle and blowing the treating solution to the printed wiring board.

77. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

flow rate regulating valves disposed in passages between the pump and the nozzle pipes, respectively; and

flow meters disposed in the passages, respectively,

said method comprising the steps of:

adjusting the flow rate regulating valves for having a first flow meter disposed for a nozzle pipe located at a center among the nozzle pipes indicate a larger flow rate than other of the first flow meter of the flow meters; and

conveying the printed wiring board while oscillating the nozzle pipes at a constant angle and blowing the treating solution to the printed wiring board.

78. (New) A manufacturing apparatus of manufacturing a printed wiring board comprising:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes independently; and

a pump for supplying a treating solution to the nozzle pipes.

79. (New) The manufacturing apparatus of claim 78, wherein the oscillating mechanism has an oscillating angle and an oscillating speed which are variable.

80. (New) The manufacturing apparatus of claim 78, wherein the oscillating mechanism comprises:

cams disposed at the nozzle pipes, respectively;

link mechanisms disposed at the nozzle pipes, respectively; and

control motors disposed at the nozzle pipes, respectively.

81. (New) The manufacturing apparatus of claim 80, wherein an oscillating angle of each the nozzle pipes is varied by adjusting each of the cams and each of link mechanisms.

82. (New) The manufacturing apparatus claim 80 wherein the oscillating mechanism further comprises one of an inverter circuit, a current control circuit, and a voltage control circuit for controlling a rotating speed of the control motors.

83. (New) The manufacturing apparatus claim 78, further comprising:

pressure regulating valves disposed in passages between the pump and the nozzle pipes, respectively; and

pressure gauges disposed in the passages, respectively.

84. (New) The manufacturing apparatus of claim 78, further comprising:

a first treating booth having the nozzle pipes disposed at a certain angle to a running direction of the printed wiring board; and

a second treating booth having the nozzle pipes disposed at a reverse angle against the certain angle to the running direction.

85. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes independently; and

a pump for supplying a treating solution to the nozzle pipes,

said method comprising the steps of:

oscillating a first nozzle pipe located at a center among the nozzle pipes in a first oscillating angle at a first oscillating speed;

oscillating other of the first nozzle pipe of the nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being smaller than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed; and

conveying the printed wiring board while blowing the treating solution to the printed wiring board.

86. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes independently;

a pump for supplying a treating solution to the nozzle pipes;

pressure regulating valves disposed in passages between the pump and the nozzle pipes, respectively; and

pressure gauges disposed in the passages, respectively,

said method comprising the steps of:

oscillating a first nozzle pipe located at a center among the nozzle pipes in a first oscillating angle at a first oscillating speed;

oscillating other of the first nozzle pipe of the nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being smaller than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed;

adjusting the pressure regulating valves for having a first pressure gauge disposed for the first nozzle pipe indicate a higher pressure than other of the first pressure gauge of the pressure gauges; and

conveying the printed wiring board while blowing the treating solution to the printed wiring board.

87. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of first nozzle pipes disposed at a certain angle to a running direction of the printed wiring board, the first nozzle pipes each having a plurality of spray nozzles mounted thereon;

a first treating booth having the first nozzle pipes;

a plurality of second nozzle pipes disposed at a reverse angle against the certain angle to the running direction, the second nozzle pipes each having a plurality of spray nozzles mounted thereon;

a second treating booth having the second nozzle pipes;

an oscillating mechanism for oscillating the first and second nozzle pipes independently; and

a pump for supplying a treating solution to the first and second nozzle pipes,

said method comprising the steps of:

oscillating a third nozzle pipe located at a center among the first nozzle pipes in a first oscillating angle at a first oscillating speed;

oscillating other of the third nozzle pipe of the first nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being smaller than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed;

oscillating a fourth nozzle pipe located at a center among the second nozzle pipes in a third oscillating angle at a third oscillating speed;

oscillating other of the fourth nozzle pipe of the second nozzle pipes in a fourth oscillating angle at a fourth oscillating speed, the third oscillating angle being smaller than the fourth oscillating angle and larger than the first oscillating angle, the third oscillating speed being larger than the fourth oscillating speed and smaller than the first oscillating speed; and

conveying the printed wiring board while blowing the treating solution to the printed wiring board.

88. (New) A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes; and

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively.

89. (New) The manufacturing apparatus of claim 88, wherein an interval between the nozzle pipes is variable.

90. (New) The manufacturing apparatus claim 88, wherein the nozzle pipes are individually movable vertically to a running direction of the printed wiring board.

91. (New) The manufacturing apparatus of claim 88, further comprising:

first support members for supporting the nozzle pipes capable of being oscillated, respectively, the nozzle pipes penetrating the first support members;

second support members for supporting the first support members movably in a specific direction, respectively; and

a supporting mechanism for supporting the second support members movably in a vertical direction to the specific direction.

92. (New) The manufacturing apparatus claim 91, further comprising:

first flexible bellows members disposed at the second support members at both sides of the first support members, for covering a region where each of the first support members moves; and

second flexible bellows members disposed at both sides of the second support members, for covering regions where the second support members move.

93. (New) The manufacturing apparatus of claim 88, further comprising:

pressure regulating valves disposed in passages running through the nozzle pipes, pressure-proof flexible tubes, and pump, respectively; and

pressure gauges disposed in the passages at downstream portions of the pressure regulating valves, respectively.

94. (New) The manufacturing apparatus of claim 88, wherein the oscillating mechanism oscillates the nozzle pipes independently.

95. (New) The manufacturing apparatus of claim 94, wherein an oscillating angle and an oscillating speed of the oscillating mechanism is variable.

96. (New) The manufacturing apparatus of claim 94, wherein the oscillating mechanism comprises:

cams;

link mechanisms; and

control motors.

97. (New) The manufacturing apparatus of claim 96, further comprising flexible wires for coupling the oscillating mechanism and the nozzle pipes, respectively.

98. (New) The manufacturing apparatus of claim 96, wherein an oscillating angle of each of the nozzle pipes varies through adjusting each of the cams and each of the link mechanisms.

99. (New) The manufacturing apparatus of claim 96, wherein the oscillating mechanism further comprises one of inverter circuits, current control circuits, and voltage control circuits for controlling rotating speed of the control motors, respectively.

100. (New) The manufacturing apparatus of claim 91, further comprising moving means for moving the first and second support members.

101 (New) The manufacturing apparatus of claim 100, wherein the moving means moves the first and second support members linearly.

102 (New) The manufacturing apparatus of claim 100, further comprising control means for controlling the moving means to control moving positions of the first and second supporting means.

103 (New) The manufacturing apparatus of claim 102, further comprising:
means for storing dimension data of the printed wiring board; and
a passage supplying the dimension data to the control means.

104 (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:
a feed roller for conveying a printed wiring board;
a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon, an interval between the nozzle pipes being variable;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes; and

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively,

said method comprising the steps of:

disposing first nozzle pipes disposed at a center among the nozzle pipes at a narrower interval than other of the first nozzle pipes of the nozzle pipes; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

105. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which comprises:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon, the nozzle pipes being individually movable vertically to a running direction of the printed wiring board;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes; and

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively,

said method comprising the steps of:

locating a first nozzle pipe located at a center among the nozzle pipes closer to the printed wiring board than other of the first nozzle pipe of the nozzle pipes; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

106 (New) The method of claim 105, wherein said step of conveying the printed wiring board comprises the sub steps of:

oscillating the first nozzle pipe in a first oscillating angle at a first oscillating speed; and

oscillating other of the first nozzle pipe of the first nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being larger than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed.

107 (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively;

pressure regulating valves disposed in passages running through the nozzle pipes, pressure-proof flexible tubes, and pump, respectively; and

pressure gauges disposed in the passages at downstream portions of the pressure regulating valves, respectively,

said method comprising the steps of:

disposing first nozzle pipes located at a center among the nozzle pipes at a narrower interval than other of the first nozzle pipes of the nozzle pipes;

adjusting the pressure regulating valves for having first pressure gauges disposed for the first nozzle pipes indicate higher pressures than other of the first pressure gauges of the pressure gauges; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

108. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively;

pressure regulating valves disposed in passages running through the nozzle pipes, pressure-proof flexible tubes, and pump, respectively; and

pressure gauges disposed in the passages at downstream portions of the pressure regulating valves, respectively,

said method comprising the steps of:

locating a first nozzle pipe located at a center among the nozzle pipes closer to the printed wiring board than other of the first nozzle pipe of the nozzle pipes;

adjusting the pressure regulating valves for having a first pressure gauge disposed for the first nozzle pipe indicate a higher pressure than other of the first pressure gauge of the pressure gauges; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

109. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively;

pressure regulating valves disposed in passages running through the nozzle pipes, pressure-proof flexible tubes, and pump, respectively; and

pressure gauges disposed in the passages at downstream portions of the pressure regulating valves, respectively,

said method comprising the steps of:

oscillating a first nozzle pipe located at a center among the nozzle pipes in a first oscillating angle at a first oscillating speed;

oscillating other of the first nozzle pipe of the nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being larger than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed;

adjusting the pressure regulating valves for having a first pressure regulating gauge disposed for the first nozzle pipe indicate a higher pressure than other of the first pressure gauge of the pressure gauges; and

conveying the printed wiring board while blowing the treating solution to the printed wiring board.

110. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes;

pressure-proof flexible tubes disposed between the nozzle pipes and the pump, respectively;

first support members for supporting the nozzle pipes capable of being oscillated, respectively, the nozzle pipes penetrating the first support members;

second support members for supporting the first support members movably in a specific direction, respectively;

a supporting mechanism for supporting the second support members movably in a vertical direction to the specific direction;

moving means for moving the first and second support members;

control means for controlling the moving means to control moving positions of the first and second supporting means;

means for storing dimension data of the printed wiring board; and

a passage supplying the dimension data to the control means,

said method comprising the steps of:

measuring dimension data of the printed circuit board in a vertical direction to a running direction of the printed wiring board;

inputting the dimension data to the means for storing dimension data;

setting an interval between the nozzle pipes according to the dimension data; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

111. (New) A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a plurality of pumps for supplying a treating solution to the nozzle pipes, respectively;

pressure gauges disposed in passages between the nozzle pipes and the pumps, respectively; and

one of an inverter circuit, current control circuit, and voltage control circuit for controlling outputs of the pumps.

112. (New) The manufacturing apparatus of claim 111, wherein the oscillating mechanism oscillates the nozzle pipes independently.

113. (New) The manufacturing apparatus of claim 112, wherein an oscillating angle and oscillating speed of the oscillating mechanism are variable.

114. (New) The manufacturing apparatus of claim 113, wherein the oscillating mechanism comprises:

cams;

link mechanisms; and

control motors.

115. (New) The manufacturing apparatus of claim 114, wherein the oscillating angle of the oscillating mechanism varies by adjusting the cams and link mechanisms.

116. (New) The manufacturing apparatus of claim 114, wherein the oscillating mechanism further comprises one of an inverter circuit, current control circuit, and voltage control circuit for controlling a rotating speed of each of the control motors.

117. (New) The manufacturing apparatus of claim 113, wherein the oscillating mechanism comprises stepping motors.

118. (New) The manufacturing apparatus of claim 117, wherein the oscillating mechanism further comprises a circuit for controlling a rotating angle or rotating speed of each of the stepping motors.

119. (New) The manufacturing apparatus of claim 113, further comprising:

means for storing treating area data of each of blocks into which the printed wiring board is divided at a dividing line in parallel with a running direction of the printed wiring board;

means for storing correction data for each of the nozzle pipes;

means for selecting selection data from the correction data;

means for calculating output data for the pumps from the selection data; and

means for controlling outputs of the pumps according to the output data.

120. (New) The manufacturing apparatus of claim 119, further comprising:

control motors for oscillating the nozzle pipes according to the output data, respectively; and

means for controlling a rotating speed of each the control motors.

121. (New) The manufacturing apparatus of claim 119, further comprising:

stepping motors for oscillating the nozzle pipes according to the output data, respectively; and

means for controlling a rotating angle or rotating speed of each of the stepping motors.

122. (New) The manufacturing apparatus claim 119, wherein means for controlling outputs of the pumps comprises one of inverter circuits, current control circuits, and voltage control circuits for controlling outputs of the pumps, respectively.

123. (New) The manufacturing apparatus of claim 121, further comprising one of an inverter circuit, current control circuit, and voltage control circuit for controlling a rotating speed of each of the control motors.

124. (New) The manufacturing apparatus of claim 122, further comprising a control/drive circuit for controlling a rotating angle or a rotating speed of each of the stepping motors.

125. (New) The manufacturing apparatus claim 120, wherein the correction data is an electric signal indicating a treating condition including at least one of a spray pressure, an oscillating speed, and an oscillating angle being set for each of the nozzle pipes.

126. (New) The manufacturing apparatus of claim 125, wherein the means for storing the correction data stores a plurality of correction data corresponding to the treating area data.

127. (New) A manufacturing apparatus of manufacturing a printed wiring board, comprising:

a feed roller for conveying a printed wiring board;

a plurality of first nozzle pipes disposed at a certain angle to a running direction of the printed wiring board, the first nozzle pipes each having a plurality of spray nozzles mounted thereon;

a first treating booth having the first nozzle pipes;

a plurality of second nozzle pipes disposed at a reverse angle against the certain angle to the running direction, the second nozzle pipes each having a plurality of spray nozzles mounted thereon;

a second treating booth having the second nozzle pipes;

an oscillating mechanism for oscillating the first and second nozzle pipes;

a plurality of pumps for supplying a treating solution to the first and second nozzle pipes, respectively;

pressure gauges disposed in passages between the first and second nozzle pipes and the pumps, respectively; and

one of an inverter circuit, current control circuit, and voltage control circuit for controlling outputs of the pumps.

128. (New) The manufacturing apparatus of claim 127, wherein the oscillating mechanism oscillates the first and second nozzle pipes independently.

129. (New) The manufacturing apparatus of claim 127, wherein an oscillating angle and oscillating speed of the oscillating mechanism are variable.

130. The manufacturing apparatus of claim 129, wherein the oscillating mechanism comprises:

cams;

link mechanisms; and

control motors.

131. (New) The manufacturing apparatus of claim 130, wherein the oscillating angle of the oscillating mechanism varies by adjusting the cams and link mechanisms.

132. (New) The manufacturing apparatus of claim 130, wherein the oscillating mechanism further comprises one of an inverter circuit, current control circuit, and voltage control circuit for controlling a rotating speed of each of the control motors.

133. (New) The manufacturing apparatus of claim 129, wherein the oscillating mechanism comprises stepping motors.

134. (New) The manufacturing apparatus of claim 133, wherein the oscillating mechanism further comprises a circuit for controlling a rotating angle or rotating speed of each of the stepping motors.

135. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a plurality of pumps for supplying a treating solution to the nozzle pipes, respectively;

pressure gauges disposed in passages between the nozzle pipes and the pumps, respectively; and

one of an inverter circuit, current control circuit, and voltage control circuit for controlling outputs of the pumps,

said method comprising the steps of:

adjusting outputs of the pumps for having a first pressure gauge disposed for a nozzle pipe located at a center among the nozzle pipes indicate a higher pressure than other of the first pressure gauge of the pressure gauges, the first pressure gauge being included in the pressure gauges; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

136. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of first nozzle pipes disposed at a certain angle to a running direction of the printed wiring board, the first nozzle pipes each having a plurality of spray nozzles mounted thereon;

a first treating booth having the first nozzle pipes;

a plurality of second nozzle pipes disposed at a reverse angle against the certain angle to the running direction, the second nozzle pipes each having a plurality of spray nozzles mounted thereon;

a second treating booth having the second nozzle pipes;

an oscillating mechanism for oscillating the first and second nozzle pipes;

a plurality of pumps for supplying a treating solution to the first and second nozzle pipes, respectively;

first pressure gauges disposed in passages between the first nozzle pipes and the pumps, respectively;

second pressure gauges disposed in passages between the second nozzle pipes and the pumps, respectively; and

one of an inverter circuit, current control circuit, and voltage control circuit for controlling outputs of the pumps,

said method comprising the steps of:

adjusting outputs of the pumps for having a third pressure gauge disposed for a nozzle pipe located at a center among the first nozzle pipes indicate a higher pressure than other of the third pressure gauge of the first pressure gauges, the third pressure gauge being included in the first pressure gauges;

adjusting outputs of the pumps for having a fourth pressure gauge disposed for a nozzle pipe located at a center among the second nozzle pipes indicate a higher pressure than other of the fourth pressure gauge of the second pressure gauges, and for having the fourth pressure gauge indicate a lower pressure than the third pressure gauge, the fourth pressure gauge being included in the second pressure gauges; and

conveying the printed wiring board while oscillating the first and second nozzle pipes and blowing the treating solution to the printed wiring board.

137. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a plurality of pumps for supplying a treating solution to the nozzle pipes, respectively;

pressure gauges disposed in passages between the nozzle pipes and the pumps, respectively; and

one of an inverter circuit, current control circuit, and voltage control circuit for controlling outputs of the pumps,

said method comprising the steps of:

oscillating a first nozzle pipe located at a center among the nozzle pipes in a first oscillating angle at a first oscillating speed;

oscillating other of the first nozzle pipe of the nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being smaller than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed; and

conveying the printed wiring board while blowing the treating solution to the printed wiring board.

138. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of first nozzle pipes disposed at a certain angle to a running direction of the printed wiring board, the first nozzle pipes each having a plurality of spray nozzles mounted thereon;

a first treating booth having the first nozzle pipes;

a plurality of second nozzle pipes disposed at a reverse angle against the certain angle to the running direction, the second nozzle pipes each having a plurality of spray nozzles mounted thereon;

a second treating booth having the second nozzle pipes;

an oscillating mechanism for oscillating the first and second nozzle pipes;

a plurality of pumps for supplying a treating solution to the first and second nozzle pipes, respectively;

first pressure gauges disposed in passages between the first nozzle pipes and the pumps, respectively;

second pressure gauges disposed in passages between the second nozzle pipes and the pumps, respectively; and

one of an inverter circuit, current control circuit, and voltage control circuit for controlling outputs of the pumps,

said method comprising the steps of:

oscillating a third nozzle pipe located at a center among the first nozzle pipes in a first oscillating angle at a first oscillating speed;

oscillating other of the third nozzle pipe of the first nozzle pipes in a second oscillating angle at a second oscillating speed, the first oscillating angle being smaller than the second oscillating angle, the first oscillating speed being larger than the second oscillating speed;

oscillating a fourth nozzle pipe located at a center among the second nozzle pipes in a third oscillating angle at a third oscillating speed;

oscillating other of the fourth nozzle pipe of the second nozzle pipes in a fourth oscillating angle, the third oscillating angle being smaller than the fourth oscillating angle and larger than the first oscillating angle, the third oscillating speed being larger than the first oscillating speed; and

conveying the printed wiring board while blowing the treating solution to the printed wiring board.

139. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a plurality of pumps for supplying a treating solution to the nozzle pipes, respectively;

a plurality of pressure gauges disposed in passages between the nozzle pipes and the pumps, respectively;

means for storing treating area data of each of blocks into which the printed wiring board is divided at a dividing line in parallel with a running direction of the printed wiring board;

means for storing correction data for each of the nozzle pipes;

means for selecting selection data from the correction data;

means for calculating output data for the pumps from the selection data; and

means for controlling an output of each of the pumps according to the output data,

said method comprising the steps of:

calculating the treating area data of each of the blocks from CAD data for drawing a wiring pattern on the printed wiring board;

inputting the treating area data into the means for storing treating area data; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

140. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a plurality of pumps for supplying a treating solution to the nozzle pipes, respectively;

a plurality of pressure gauges disposed in passages between the nozzle pipes and the pumps, respectively;

means for storing treating area data of each of blocks into which the printed wiring board id divided at a dividing line in parallel with a running direction of the printed wiring board;

means for storing correction data for each of the nozzle pipes;

means for selecting selection data from the correction data;

means for calculating output data for the pumps from the selection data;

means for controlling an output of each of the pumps according to the output data;

control motors for oscillating the nozzle pipes according to the output data, respectively; and

means for controlling a rotating speed of each of the control motors,

said method comprising the steps of:

calculating treating area data of each of the blocks from CAD data for drawing a wiring pattern on the printed wiring board;

inputting the treating area data to the means for storing treating area data; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

141. (New) A method of manufacturing a printed wiring board using a manufacturing apparatus which includes:

a feed roller for conveying a printed wiring board;

a plurality of nozzle pipes each having a plurality of spray nozzles mounted thereon;

an oscillating mechanism for oscillating the nozzle pipes;

a plurality of pumps for supplying a treating solution to the nozzle pipes, respectively;

a plurality of pressure gauges disposed in passages between the nozzle pipes and the pumps, respectively;

means for storing treating area data of each of blocks into which the printed wiring board is divided at a dividing line in parallel with a running direction of the printed wiring board;

means for storing correction data for each of the nozzle pipes;

means for selecting selection data from the correction data;

means for calculating output data for the pumps from the selection data;

means for controlling an output of each of the pumps according to the output data;

stepping motors for oscillating the nozzle pipes according to the output data, respectively; and

means for controlling a rotating angle or a rotating speed of the stepping motors,

said method comprising the steps of:

calculating treating area data of each blocks from CAD data for drawing a wiring pattern on the printed wiring board;

inputting the treating area data to the means for storing treating area data; and

conveying the printed wiring board while oscillating the nozzle pipes and blowing the treating solution to the printed wiring board.

142. (New) The manufacturing apparatus of claim 69, wherein the treating solution is an etchant.

143. (New) The method of claim 76, wherein the treating solution is an etchant.

144. (New) The manufacturing apparatus of claim 71, wherein the treating solution is an etchant.

145. (New) The manufacturing apparatus of claim 73, wherein the treating solution is an etchant.

146. (New) The manufacturing apparatus of claim 78, wherein the treating solution is an etchant.

147. (New) The manufacturing apparatus of claim 88, wherein the treating solution is an etchant.

148. (New) The manufacturing apparatus of claim 111, wherein the treating solution is an etchant.

149. (New) The manufacturing apparatus of claim 127, wherein the treating solution is an etchant.

150. (New) The method of claim 77, wherein the treating solution is an etchant.

151. (New) The method of claim 85, wherein the treating solution is an etchant.

152. (New) The method of claim 86, wherein the treating solution is an etchant.

153. (New) The method of claim 87, wherein the treating solution is an etchant.

154. (New) The method of claim 104, wherein the treating solution is an etchant.

155. (New) The method of claim 105, wherein the treating solution is an etchant.

156. (New) The method of claim 107, wherein the treating solution is an etchant.

157. (New) The method of claim 108, wherein the treating solution is an etchant.

158. (New) The method of claim 109, wherein the treating solution is an etchant.

159. (New) The method of claim 110, wherein the treating solution is an etchant.

160. (New) The method of claim 135, wherein the treating solution is an etchant.

161. (New) The method of claim 136, wherein the treating solution is an etchant.

162. (New) The method of claim 137, wherein the treating solution is an etchant.

163. (New) The method of claim 138, wherein the treating solution is an etchant.

164. (New) The method of claim 139, wherein the treating solution is an etchant.

165. (New) The method of claim 140, wherein the treating solution is an etchant.

166. (New) The method of claim 141, wherein the treating solution is an etchant.

REMARKS

Kindly enter the above claim amendments prior to initial examination. These amendments are effective to cancel all previous claims and add new claims 69-166.

Also, Proposed Drawing Amendments are presented herewith under separate cover letter in order to make corrections to Fig. 2.

Respectfully submitted,

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September 12, 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	
Kazutomo HIGA	:	**Attn: BOX PCT**
Serial No. NEW	:	Docket No. 2001_1202A
Filed September 12, 2001	:	

MANUFACTURING APPARATUS OF PRINTED WIRING BOARD, AND MANUFACTURING METHOD OF PRINTED WIRING BOARD USING THE SAME

**[Corresponding to PCT/JP01/00085
Filed January 11, 2001]**

LETTER RE PROPOSED DRAWING AMENDMENTS

Assistant Commissioner for Patents,
Washington, D.C.

Sir:

Enclosed herewith is a photocopy of Fig. 2 marked in red to indicate proposed drawing amendments thereto.

The Examiner is requested to approve such proposed drawing amendments

Respectfully submitted,

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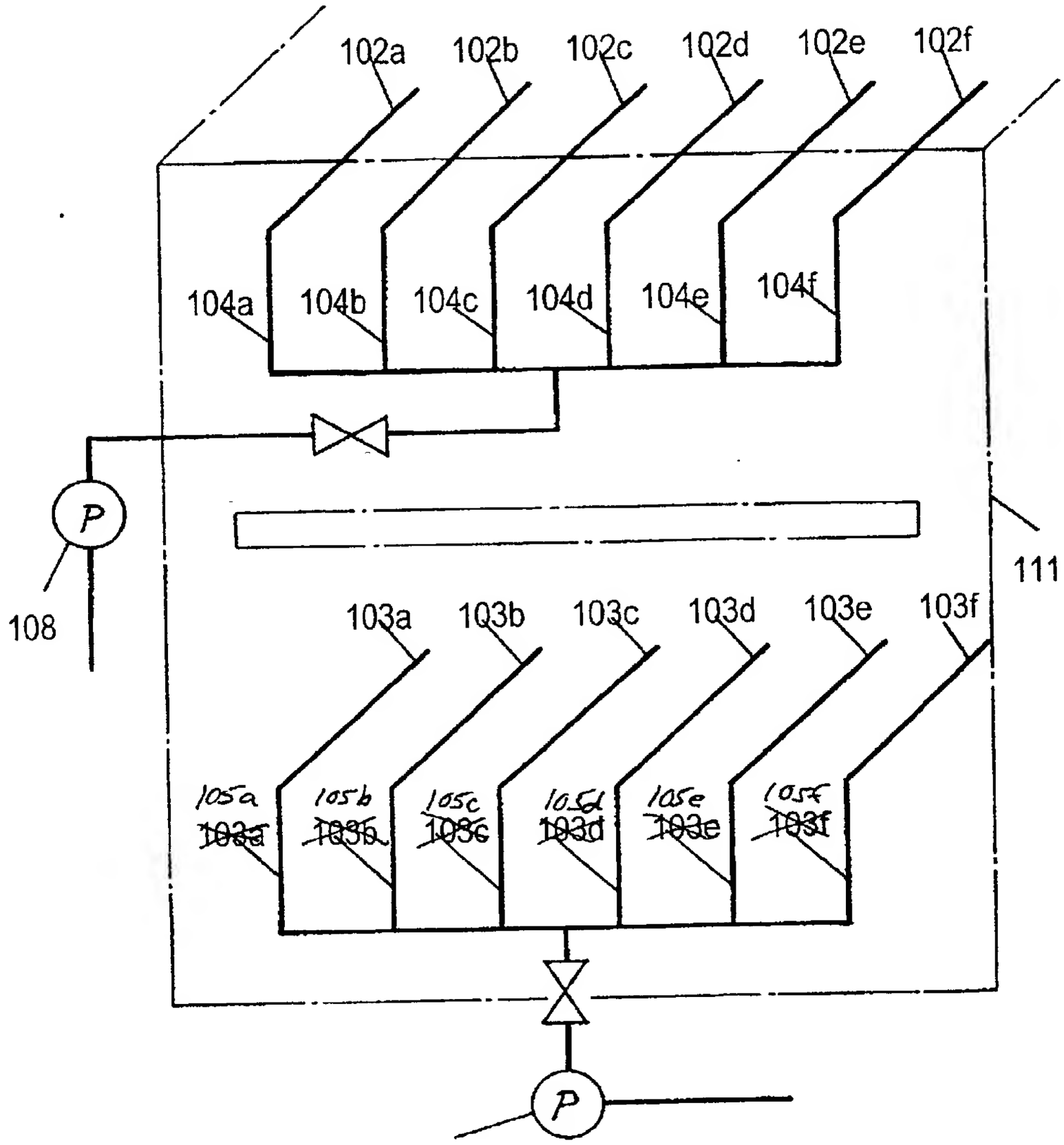
September 12, 2001

Fig. 2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